

IN THE CLAIMS:

Please amend the claims as set forth in the following listing. This listing of the claims replaces all prior versions and listings of the claims in the present application.

1. (Currently amended) A method for regulating resource usage by a plurality of distributed applications running on a plurality of interconnected machines, the method comprising:

providing a system comprising a plurality of machines connected to each other through a network, wherein the plurality of machines run one or more operating systems;

at each machine:

detecting applications running on the machine; and

detecting the operating system processes and network traffic associated with the application;

receiving an initial resource allocation policy based on the detected applications and operating system processes and network traffic associated with the applications ~~having a set of resource utilization goals;~~

gathering, by [[a]] the plurality of interconnected machines, information on the state and health of applications and system resources at each of the machines;

distributing among the machines the initial resource allocation policy, wherein each machine receiving receives a subset of the total information gathered and a portion of the initial resource policy, wherein the subset of the total information received by each machine corresponds to one or more applications running on that machine;

each machine detecting one or more requests for resources by [[each]] one or more of the plurality of distributed applications;

at each of the plurality of interconnected machines, allocating the resources to [[each]] the one or more of the plurality of distributed applications based on the subset of the total information gathered;

determining the resource consumption by the each application in the plurality of [[each]] distributed applications based on its actual usage;

periodically exchanging resource information amongst the plurality of interconnected machines, wherein the resource information includes requests for the resources, resource consumption, [[and]] resource availability at at least one each of the plurality of interconnected machines, the current demand levels and the application priorities; and

at each of the plurality of interconnected machines, adjusting the resources to each application of the plurality of distributed applications based upon the periodically exchanged

resource information received by that machine.

2. (Previously presented) The method of claim 1, wherein said resources include one or more of communication resources, network bandwidth shared by the plurality of machines, computing resources, processing resources available at the plurality of machines, memory resources available at the plurality of machines.

3 – 12. (Cancelled).

13. (Previously presented) The method of claim 1, wherein each machine comprises:
a kernel space; and
a user space module, wherein each of the user-space modules comprises:
a data store for writing persistent data to the local disc of the host computer, wherein data is redundantly replicated on the local disc of a configurable number of peer hosts;
a shepherd for organizing and maintaining a configuration of machines in the kernel space which can be made available to other resources;
a policy manager for tracking the policies specified for applications and the available resources, for monitoring the resource utilization, and for storing the monitoring information in the data store;
a request manager for authenticating a user of the system and for passing valid requests received from the user to the user-space module;
an event scheduler for receiving events from the kernel space and supplying the information to other components in the user-space module; and
a process scheduler for receiving information from the policy manager about resource entitled to each program, monitoring all processes running on a machine and communicating to the policy manager the resource utilization of each program,
wherein the priorities for allocation of resources are adjusted based on occurrence of particular events, wherein the policy manager receives information about the occurrence of the events and monitors the resource utilization of all applications, jobs, processes and flows and records the information in a data store.

14. (Original) The method of claim 1, wherein said detecting step includes detecting each instance of a program running at each of the plurality of machines.

15. (Previously presented) The method of claim 1, further comprising a system user interface, wherein said detecting step is performed by application detection rules established by a user.

16. (Cancelled).

17. (Previously presented) The method of claim 1, wherein the plurality of interconnected machines comprises a flow scheduler, wherein each machine includes a portion of the flow scheduler, wherein said exchanging step is performed by the flow scheduler.

18-20. (Cancelled).

21. (Original) The method of claim 1, wherein said exchanging step includes using a bandwidth-conserving protocol.

22. (Previously presented) The method of claim 1, wherein said allocating step includes one or more of regulating usage of resources by each of the plurality of programs, scheduling processing resources at each of the plurality of machines, regulating the volume of communications sent by a particular program and delaying the sending of a communication by a particular program.

23-25. (Cancelled).

26. (Original) The method of claim 1, further comprising:
collecting resource information regarding requests for resources and resource availability;
and
generating resource utilization information for display to a user based upon the collected resource information.

27-29. (Cancelled).

30. (Currently amended) A system for regulating utilization of computer resources of a plurality of interconnected computers, the system comprising:

a plurality of computers having local resources to be regulated which are interconnected to each other through a network, wherein each computer comprises:

- a kernel space; and

- a user-space module comprising:

 - a monitoring module provided at each computer having resources to be regulated, for monitoring resource utilization and providing the resource utilization information to other interconnected computers having resources to be regulated;

 - a manager module for providing a global, distributed policy governing the global utilization of resources available on the plurality of computers; and

 - an enforcement module at each computer for which resources are to be regulated for regulating usage of resources based on said global, distributed policy and the resource utilization information received from other interconnected computers,

wherein each computer of the plurality of computers is configured to perform the steps of:

- detecting applications running on the computer; and

- detecting the operating system processes and network traffic associated with the application;

wherein the plurality of interconnected machines are configured for:

- gathering information on the state and health of applications and system resources; and

- distributing among the machines the initial resource allocation policy, wherein each machine receives a subset of the total information gathered and a portion of the initial resource policy, wherein the subset of the total information received by each machine corresponds to one or more applications running on that machine;

wherein each computer is configured for:

- detecting one or more requests for resources by one or more of the plurality of distributed applications;

- allocating the resources to the one or more of the plurality of distributed applications based on the subset of the total information gathered; and

- determining the resource consumption by the each application in the plurality of distributed applications based on its actual usage;

- wherein the plurality of interconnected machines are configured for periodically exchanges-exchanging resource information with other computers of the plurality of

computers, wherein the resource information including includes updates to the global, distributed policy, requests for the resources, resource consumption, resource availability at each of the plurality of interconnected machines, the current demand levels and the application priorities; and
at each of the plurality of interconnected machines, adjusting the resources to each application of the plurality of distributed applications based upon the periodically exchanged resource information received by that machine.

31-32. (Cancelled).

33. (Previously presented) The system of claim 30, wherein said user-space module comprises:

- a data store for writing persistent data to the local disc of the host computer, wherein data is redundantly replicated on the local disc of a configurable number of peer hosts;

- a shepherd for organizing and maintaining a configuration of machines in the kernel which can be made available to other resources;

- a policy manager for tracking the policies specified for applications and the available resources, for monitoring the resource utilization, and for storing the monitoring information in the data store;

- a request manager for authenticating a user of the system and for passing valid requests received from the user to the user-space module;

- an event scheduler for receiving events from the kernel space and supplying the information to other components in the user-space module; and

- a process scheduler for receiving information from the policy manager about resource entitled to each program, monitoring all processes running on a machine and communicating to the policy manager the resource utilization of each program.

34-39. (Cancelled).

40. (Previously presented) The system of claim 30, wherein said monitoring module at a given computer provides resource utilization information to each other connected computer in response to particular events, wherein said resource utilization information provided by said

monitoring module includes one or more of information regarding requests for communication resources and information regarding requests for processing resources.

41. (Previously presented) The system of claim 30, wherein said resource utilization information provided by said monitoring module includes information regarding requests for one or more of communication resources and processing resources.

42-45. (Cancelled).

46. (Original) The system of claim 30, wherein said monitoring module uses a bandwidth-conserving protocol for providing resource utilization information.

47. (Original) The system of claim 30, wherein said enforcement module schedules processing resources at each of the plurality of computers based on said transferred rules and the resource utilization information.

48-49. (Cancelled).

50. (Previously presented) The system of claim 30, further comprising:
a configuration module for a user to establish rules governing utilization of resources, wherein said configuration module collects resource utilization information from the plurality of computers, wherein said configuration module suggests rules governing utilization of resources based, at least in part, upon the collected resource utilization information, and wherein said configuration module is operable to display the collected resource utilization information to a user.

51-53. (Cancelled).

54. (Currently amended) A method for scheduling communications by a plurality of applications running on a plurality of computers connected to each other through a network, the method comprising:

providing a system comprising a plurality of machines connected to each other through a network, wherein the plurality of machines run one or more operating systems;
at each machine:

detecting applications running on the computer; and
detecting the operating system processes and network traffic associated with the
application;

gathering, by ~~[[a]]~~ the plurality of interconnected machines, information on the state and health of applications and system resources at each of the machines;

receiving, at each of the interconnected machines, a subset of a global, distributed policy, wherein each machine receives a subset of the total information gathered, wherein the subset of the total information received by each machine corresponds to one or more applications running on that machine, wherein the policy specifies priorities for scheduling communications by the plurality of applications;

at each of the plurality of computers, detecting requests to communicate and identifying a particular application associated with each request;

at each of the plurality of interconnected machines, allocating the resources to each of the plurality of distributed applications based on the subset of the total information gathered;

determining the resource consumption by the plurality of each application based on its actual usage;

periodically exchanging bandwidth information amongst the plurality of computers, wherein the bandwidth information includes updates to the global, distributed policy, requests for the resources, resource consumption, resource availability at each of the plurality of interconnected machines, the current demand levels and the application priorities, wherein the bandwidth information includes the application making the requests to communicate and a measure of the communications resources required to fulfill the requests; and

at each of the plurality of computers, scheduling communications based upon the received subset of the global, distributed policy and the bandwidth information.

55. (Cancelled).

56. (Original) The method of claim 54, wherein said communication resources include network bandwidth shared by the plurality of computers.

57-58. (Cancelled).

59. (Previously presented) The method of claim 54, wherein said scheduling step includes one or more of the steps of immediately transmitting all communications if the bandwidth

information indicates communication traffic is light, delaying a portion of the communications if the bandwidth information indicates communication traffic is heavy, delaying transmission of communications by lower-priority applications and load balancing, wherein said load balancing includes redirecting communications received at a first computer to a second computer.

60-65. (Cancelled).